IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Bigus et al.**	§	
	§	Group Art Unit: **2129**
Serial No. **10/670,149**	§	
	§	Examiner: **Tran, Mai T.**
Filed: **September 24, 2003**	§	
	§	
For: **Apparatus and Method for Monitoring System Health Based on Fuzzy Metric Data Ranges and Fuzzy Rules**	§	
	§	

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REPLY BRIEF (37 C.F.R. 41.41)

This Reply Brief is submitted in response to the Examiner's Answer mailed on July 16, 2007.

No fees are believed to be required to file a Reply Brief. If any fees are required, I authorize the Commissioner to charge these fees which may be required to IBM Corporation Deposit Account No. 50-0510.

RESPONSE TO EXAMINER'S ANSWER

The examiner makes several erroneous statements in the examiner's answer of July 16, 2007. Therefore, this reply brief is required.

I. Argument 1

In the examiner's answer, the examiner makes the following assertions:

> In summary, appellants mainly argued that "computing system component" and "the health of a computing system" as claimed are not the same as "a communication connection" and "evaluating the quality of a communications connection" in *Arnold.*
>
> In response, the examiner disagrees. Appellants are reminded that during patent examination Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. In re Morris, 127 F.3d 1048, 1054- 55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. E-Pass Techs, Inc. v. 3Com Corp., 343 F.3d 1364, 1369, 67 USPQ2d 1947, 1950 (Fed. Cir. 2003) (**claims must be interpreted "in view of the specification" without importing limitations from the specification into the claims unnecessarily**). In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969) (Emphasis added).
>
> Examiner applied correctly the standard above and has not gone beyond the teachings of the specification as appellants asserted since appellants' field of invention relates to computing system. .Examiner applied prior art found in the same field of endeavor. Moreover, since the terms "computing system component" and "the health of a computing system" were not further defined in the claims, the applied art still reads on the claimed invention.
>
> Examiner notes that the plain, ordinary, and accustomed meaning of the term "computing system" generally corresponds to a system containing one or more computers. Examiner asserts the communication connections in communication network of *Arnold* to read on a computing system component of appellants since the communication networks are complex systems that contain several thousand components i.e. computers.
>
> Regarding the "health of a computing system", Examiner also notes that the plain, ordinary, and accustomed meaning of the term "health" generally corresponds to a state of well-being of a person if it is used to

> apply to human being, or an overall condition of a machine, a system, or in the instant case a computing system. Examiner asserts *Arnold* teaches in col.> 4, lines 8-14, specifically lines 11-12 where it stated 'a reliable statement about the respective condition of the network" to read on "the health of a computing system." Outputting which was not further defined reads on generating statements, Col. 4 and generating numbers that indicate condition, Col. 8. At least respective condition col. 4 and 8 reads on health. Although the examiner has cited a few portions of the reference, the appellant should have read the entire reference and understood how *Arnold* (at least cols. 3-8) clearly disclose measuring network/computer data/parameters with fuzzy logic (col. 3, lines 22-45), and outputting and making decisions based on the fuzzy rule set (col. 5 even specifies how decisions are output for routing decisions to be made). On this basis, Examiner asserts *Arnold* anticipated the argued limitations. Therefore, the rejection STANDS.

Examiner's answer of July 16, 2007, pp. 11-13 (emphasis in original).

Claim 1 is reproduced again below for reference:

> 1. A computer-implemented method of determining a health of a computing system component, the computer-implemented method comprising:
>
> generating at least one fuzzy data set associated with at least one measured metric of the computing system component, wherein the fuzzy data set defines fuzzy regions indicating different categories of the measured metric;
>
> generating at least one fuzzy rule set associated with the at least one measure metric, wherein the fuzzy rule set defines a relationship of the fuzzy regions of the fuzzy data set to categories of computing system component health; and
>
> outputting the health of the computing system component based on the at least one fuzzy data set and the at least one fuzzy rule set.

Although the examiner continues to correctly cite the law, the examiner continues to misapply the stated standards of the law to the claims. The examiner believes that the term "health of the computing system," as claimed was not further defined in the claims and, for this reason, *Arnold* (U.S. Patent No. 5,822,301) teaches the features of claim 1. The examiner also believes that the plain meaning of the term "computer system" generally corresponds to a system containing one or more computers. The examiner then asserts that communication connections in a communication network reads on the claimed computing system component in that communication networks contain thousands of computers. The examiner also believes that the

plain meaning of "health," as claimed, relates to the state of well-being, and that *Arnold* describes providing a statement about a condition of the network.

However, again, the examiner has missed the fundamental differences between the explicit language of claim 1 and the plain teachings of *Arnold*. *Arnold* relates to monitoring of *networks*. As the examiner appears to recognize, networks are formed among computers, perhaps thousands or even millions of computers.

<u>However, the fact that a network must be built using computer hardware does not mean that a network *is* hardware</u>. As shown in *Arnold*, col. 7, ll. 23-42 (quoted in the appeal brief), a "condition" of a network relates to variables in terms of *elapsed time* and *reliability* for sending *data packets* from one network device to another. Thus, the "conditions of the network" in *Arnold* is related to how the network *behaves*, <u>*not of the hardware devices themselves*</u>.

The examiner's assertions are not consistent with Applicant's specification, as required by *In re Prater*. The examiner's assertions to the contrary are manifestly incorrect in view of the fact that Applicant's specification describes the health of a computer system in terms of workload type metrics include, for example, processor utilization, page fault rates, number of threads, number of hits on a web site, number of database queries, number of database connections, and other similar metrics indicating the workload and/or resource utilization of the computer system. These items have *nothing* to do with the behavior of networks, as provided in *Arnold*.

Note that Applicants do not refer to the specification in an attempt to read these features into the claims. Instead, Applicants use the specification to rebut the erroneous proposition that the examiner's interpretation of the claims and of *Arnold* is consistent with the specification, as required by *In re Praeter*. Given the stark differences between the specification and the teachings of *Arnold*, the examiner cannot, under the law, make the leap that *Arnold* teaches a "health of a computer system," as required by claim 1.

Therefore, the *Arnold* does not teach all of the features of claim 1. Accordingly, *Arnold* does not anticipate claim 1.

II. Argument 2

In the examiner's answer, the examiner makes the following assertions:

> In summary, appellants mainly argued that appellants1 heath of the computing system comprises processor workload type metrics, and is-not concerned with the network speed and reliability of *Arnold.*
>
> In response to appellants' argument, there is no mention of these limitations in the claims and the specification is not the measure of the invention. Therefore, limitations contained therein can not be read into the claims for the purpose of avoiding the prior art; see In re Sprock, 55 CCPA 743, 386 F.2d 924, 155 USPQ 687 (1968).
>
> Regarding the "health of a computing system", Examiner also notes that the plain, ordinary, and accustomed meaning of the term "health" generally corresponds to a state of well-being of a person if it is used to apply to human being, or an overall condition of a machine, a system, or in the instant case a computing system. Examiner asserts *Arnold* teaches in col. 4, lines 8-14, specifically lines 11-12 where it stated 'a reliable statement about the respective condition of the network" to read on "the health of a computing system." Although the examiner has cited a few portions of the reference, the appellant should have read the entire reference and understood how *Arnold* (at least cols. 3-8) clearly disclose measuring network/computer data/parameters with fuzzy logic (col. 3, lines 22-45), and outputting and making decisions based on the fuzzy rule set (col. 5 even specifies how decisions are output for routing decisions to be made).
>
> On this basis, Examiner asserts *Arnold* anticipated the argued limitations. Therefore, the rejection STANDS.

Examiner's answer of July 16, 2007, pp. 14-15.

The examiner asserts that the claims do not mention the type of metrics used to monitor a health of a computing system. For this reason, the examiner asserts, these limitations cannot be read into the claims. The examiner also reiterates the erroneous proposition that *Arnold* teaches monitoring a health of a computing system, as required in claim 1. The examiner then asserts again, erroneously and without any support, that "appellant *'should have read'* the entire reference and understood how *Arnold* 'clearly' discloses the measuring of network/computer data/parameters with fuzzy logic.

Every statement of fact the examiner makes in this section of the reply is erroneous. First, as shown above, applicants do not, in any way, attempt to read the various metrics described in the specification into the claimed inventions. Rather, applicants instead rebut the examiner's erroneous proposition that the claimed term "health of the computing system" can reasonably be interpreted in the light of the specification as reading on the teachings of *Arnold*.

The examiner cannot, on one hand, argue that *Arnold* teaches the explicit language of claim 1 *based on the specification*, and then turn around and argue, on the other hand, that Applicants cannot use the same portion of the specification to rebut the examiner's argument. The examiner's apparent belief to the contrary belies the examiner's misunderstanding of the references and of the law, and further belies the examiner's misapplication of the law and references to the claims. As shown above and in the appeal brief, absolutely no basis exists for the proposition that Applicant's specification supports the interpretation that the explicit term "health of the computing system" reads on monitoring a *behavior of a network*, as taught in *Arnold*. Therefore, this portion of the examiner's reply is wholly rebutted.

Second, the examiner's assertion that Applicants "should have read" the entirety of *Arnold* is without merit and without foundation. Applicants have carefully analyzed all of the teachings of *Arnold*. Based on that analysis, Applicants are sufficiently confident that the Board will come to the same conclusion as Applicants - that *Arnold* simply does not teach the explicit language of claim 1 - that Applicants have invested many hours of time and thousands of dollars into disproving the examiner's spurious rejections and erroneous conclusions.

To further prove that the examiner is manifestly correct, Applicants reproduce below the *entire* portion of *Arnold* cited by the examiner. Although onerous, this analysis is made necessary by the examiner's manifestly incorrect statements.

> SUMMARY OF THE INVENTION
>
> It is an object of the present invention to provide an improved communication arrangement and an improved method for evaluating at least two multi-part communication connections between two parties to a communication in a multi-node network.
>
> In general terms the present invention is a method for the evaluation of at least two multi-part communication connections in a multi-node network. At least two evaluation categories are determined for evaluating a communication connection. At least respectively one measured value that

describes the connection with respect to the respective evaluation category is acquired for each determined evaluation category for a respective communication connection. An evaluation criterion is determined for the respective communication connection in that the appertaining measured values are evaluated in the form of satisfaction degrees with respect to the satisfaction of the respective evaluation category and all satisfaction degrees are operated with one another such that the communication connection that has higher satisfaction degrees with respect to the evaluation categories receives an optimum evaluation criterion

Advantageous developments of the method of the present invention are as follows.

At least performance of the respective communication connection and/or time behavior of the respective communication connection and/or dependability of the respective communication connection is respectively determined as evaluation category.

Measured values to be acquired are at least respectively determined for: Performance (transmission capacity, transmission costs, transmission time); Time Behavior (delay time between two nodes, time change of the delay time between two nodes); and Dependability (connection dependability, node dependability, packet dependability.

The measured values are processed with fuzzy logic, in that they are treated like linguistic variables whose satisfaction degrees are identified using affiliation functions, in that at least one fuzzy rule set is employed for each of the evaluation categories. The evaluation criterion for the respective communication connection is formed with two-time application of fuzzy logic, in that the satisfaction degrees for the individual evaluation categories are processed with fuzzy logic, whereby they are handled as linguistic variables that are evaluated using at least one principal fuzzy rule set. In a further embodiment at least respective rule sets that operate the following variables with one another are employed: costs of the communication connection with its transmission capacity; transmission time with the costs of the communication connection; delay time between two nodes with the time change of the delay time between two nodes; and connection dependability of the communication connection with its packet dependability.

In another embodiment at least respective rule sets that operate the following variables with one another are employed as principal fuzzy rule set: time behavior of the communication connection with its dependability; time behavior of the communication connection with its performance; and performance of the communication connection with its

dependability.

Potential communication connections are evaluated and potential communication connection is selected for the set up of a real connection which receives the optimum evaluation criterion.

The present invention is also a communication arrangement for the implementation of the above-described method, whereby the communication nodes and communication sub-links between the communication nodes are arranged such that two parties to a communication are connectable to one another via at least two communication connections. In a further embodiment of this communication arrangement, the method is implemented at each communication node.

A particular advantage of the inventive method is that a plurality of metric parameters that describe different aspects of the communication connection can be utilized in the evaluation of the connection for the first time. The evaluation categories of time behavior, dependability and capacity of the communication connection are especially advantageously selected given employment of the inventive method since a comprehensive description and evaluation of the respective connection thus becomes possible.

A plurality of measured quantities are beneficially acquired in the determination of the measured parameters, that is, the routing metrics for the individual evaluation categories since a reliable statement about the respective condition of the network can thus be made. It also thus becomes possible to weight the individual measured quantities and balance them relative to one another.

The inventive method is especially advantageously implemented by the employment of fuzzy logic because this is noted therefor that it allows the employment and the evaluation of a plurality of equivalent measured quantities in an especially simple way. A single fuzzy rule set is thereby advantageously evaluated for each individual weighting category.

A plurality of measured quantities that were evaluated in a first step with a single fuzzy rule set are again especially advantageously presented as a linguistic variable by the inventive method, whereby a linguistic variable can thus be found for every individual weighting category that, following thereon, then contributes to a weighting for the respective communication connection to be evaluated with a further fuzzy rule set, the main rule set.

In order to be able to accomplish an evaluation of the connection that is close to practice, fuzzy rule sets are advantageously formed for costs and transmission capacity, transmission time and costs, delay time and variation of the delay time, as well as for the call dependability and the packet security. Beneficially, fuzzy rules are evaluated for the main rule set with the inventive method in a second evaluation stage that links the time behavior of the communication connection to the dependability, the time behavior of the communication connection to the capacity, and the capacity of the communication connection to the dependability of the connection. An evaluation of the respective connection that is close to practice is assured by applying these linkages.

Beneficially, the inventive method is utilized for evaluating potentially possible communication connections and that which receives the most beneficial evaluation criterion, that is, the weight, is selected. It is assured in this way that an optimum use is achieved for a communication user. The inventive method is beneficially utilized in a communication arrangement that allows ring-shaped connections of two parties to a communication via a plurality of relay stations, since the network load and the costs for the parties to the communication can thus be minimized.

The inventive method is beneficially implemented at each node of a communication network, since a redundancy is thus assured and the correct network data are always currently available.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages, may best be understood by reference to the following description taken in conjunction with the accompanying drawings, in the several Figures of which like reference numerals identify like elements, and in which:

FIG. 1 shows a block circuit diagram as an example of an inventive method;

FIG. 2 shows a schematic illustration of a fuzzy evaluation system;

FIG. 3 recites an example of the affiliation functions of the linguistic variables of capacity;

FIG. 4 recites an example of the affiliation functions for the linguistic variable of performance;

FIG. 5 recites an example of the linguistic variable of weighting; and

FIG. 6 recites an example for the measurement of the delay time between two communication nodes.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As an example, FIG. 1 shows a schematic diagram for the interaction of a plurality of components in a multi-node network. For example, a module Top of every node identifies the topology of the network. This occurs, for example, by measuring the individual connection lengths between the various nodes. For example, the delay time of each and every node can also be determined with the connections incident to it. For example, these data are subsequently communicated to all other nodes with the assistance of a flooding method Floo, referred to as flooding above. In a further module, the best nodes are identified with the assistance of a theoretical algorithm Sho. The inventive method thus begins at the point where it is important to improve the measurement, the determination and evaluation of the topology parameters. Routing metrics were also mentioned above in this context. For example, a fuzzy system Fuzz allows significantly more than one or two parameters to be easily linked to a general evaluation of the connections. This evaluation of the connection can then be employed as input quantity for a shortest-path algorithm (element Sho in FIG. 1). For example, such a routing method should be installed in each network node. For example, each node determines the input parameters of the connections incident with it for the inventive fuzzy system. It should be noted in this context that the fuzzy logic seems most suitable for the implementation of the invention but that other methods can be employed with which a plurality of quantities can be evaluated with respect to their weights. Fuzzy logic is only presented here as an exemplary solution in order to make it clear what is involved in the invention. For example, the inventive method is implemented as soon as a significant modification of one of the input parameters has derived. This modification is identified, for example, in the module Top of the schematic drawing in FIG. 1 and is subsequently forwarded to the evaluation modules Fuzz. When this evaluation of the new connection parameters leads, for example, to a change in the evaluation of at least one of the connections then, for example, the vector of the updated evaluations for the connections is distributed over the network by flooding, the routing table is updated using a shortest-path algorithm, for example the SPF algorithm.

A few input parameters for the evaluation of connections shall be recited below; however, not all of these were realized in the inventive method. For example, all information available on the level of the routing in the network are available for selection as input quantities of the inventive

method. The following parameters thereby particularly seem suitable. The connection length as physical distance between two nodes. Since it is not only the distance between nodes but also the nature of the transmission medium (for example, copper cable, optical fiber cable, radial link) that influences the time that the signals require to proceed from one node to the next, it seems beneficial to select the transmission time for a packet as input for the inventive method. When, for example, one proceeds on the basis of a datagram-oriented network, then the transmission time for an entire packet can likewise be employed like the signal running time between two nodes. What is thereby meant by transmission time is the time that elapses from the beginning of the transmission onto the medium (the first bit of the packet is supplied into the network) until the last bit of the packet has reached the next node. As long as a connection exists, the transmission time is a constant quantity for the respective connection. The delay time that a packet experiences on its path from one node to the following node represents a further input quantity that can be measured as time. For example, the time is thereby measured that elapses from the point in time of transmitting a packet to a neighboring node up to the arrival of the acknowledgment that the neighboring node returns. The packet is thereby accompanied by a time stamp with the starting point in time which is sent to the transmitting node in the acknowledgment. What is thereby achieved is that only the clock of the transmitting node participates in the measurement. The constant part of the sending time is, for example, the transmission time. Essentially entering thereinto are the times that are consumed from protocol processing and in the queue.

The load situation, for example, thereby also indirectly enters into the evaluations of the connection, as shown in FIG. 6. The difference between the delay time and the transmission time is shown therein. In FIG. 6, time t.sub.0 represents the point in time at which the sender Sen sends a packet. Time t.sub.i references the point in time at which a sent packet is entered into the input queue at the receiver Em. Time t.sub.2 references the point in time at which the acknowledgment is returned. t.sub.3 denotes that the receiver receives the acknowledgment and can implement a comparison of the time stamp with the internal clock. The transmission time in FIG. 6 is thus calculated as t.sub.1 -t.sub.0. The sender Sen and the receiver Em, for example, are thus two nodes within a multi-node communication network. Since the delay time is one of the most important parameters, the change of the delay time is also measured and is selected as input into the inventive evaluation system. The underlying idea is thereby that, given a momentarily increasing delay time on a connection, one must count on an increased delay time with the next seconds and this connection is therefore to be evaluated less high. Since the load on a computer network fluctuates, for example, with the time of day, it seems meaningful to likewise have this enter into the evaluation of a connection. When, however, short

intervals are selected for measuring the measured parameters, then the fluctuations dependent on the time of day are also covered and the acquisition of the time of day parameter can be forgone. In view of future technologies such as, for example, ATM networks and applications such as multimedia and broadband services, the type of traffic (data, voice, video, . . .) can also enter into the routing decision. This, however, means that a separate routing table is to be calculated for each type of traffic, denoting a higher memory and calculating outlay. Further, the capacity of the line can also be taken into consideration because, given a high and increasing delay time, it must be anticipated that the band width of the connection is already fully exploited. The message length, for example the plurality of packets that belong to a message, can likewise be evaluated when it is known at the beginning of a transmission. For example, this could be employed for predictions about the load situation to be anticipated. The hop plurality, previously also referred to as plurality of relay stations on a connecting path, could likewise be involved in the routing decision; however, this is only meaningful when distributed routing does not occur. Further, the age of the routing information is available as an input for the evaluation system. When, for example, the costs for the use of a connection are co-introduced into the evaluation of the connection, then the traffic can be more likely routed via more cost-beneficial connections than via expensive connection. It must thereby be taken into consideration, however, that the cheap connections could be overloaded. The dependability of the connection produces a further parameter. For example, the failsafe dependability or, respectively, the trust in the availability of a connection is thereby calculated as probability that the connection will not go down. The failsafe dependability of the neighboring node in a communication network can likewise be made known to the respective communication network. For example, neighboring nodes that are known to be more stable than others can thereby be selected in routing decisions. A further parameter can be represented by the packet loss probability. This parameter describes the probability that a packet will be lost due to overload situations.

In the inventive method, these recited parameters are advantageously combined in three evaluation categories. For example, they serve the inventive method as input variables for a two-stage fuzzy system that determines a weighted connection length. The following three groups are advantageously formed:

1. "Capacity", "costs" and "transmission time" are combined, for example, to form the group of performance criteria.

2. "Delay time" and the "change in the delay time" are combined, for example, as criteria of the time behavior of the connection.

3. The three quantities "dependability of the connection", "failsafe dependability of the neighboring node" and the "packet loss probability" are combined, for example, to form the group of dependability criteria. The inventive method is thereby designed such that no specifically existing computer network must form the basis of its functioning.

FIG. 2 recites an example of an inventive evaluation system of communication connections. It is schematically shown here. Rectangular boxes thereby denote linguistic variables, circles denote the rule base and triangles denote what are referred to as processor units that can implement calculating tasks. The inventive method is advantageously conceived as a two-stage system. In the first stage, for example, the input quantities are classified into the three aforementioned groups. Capacity is referenced Kap, costs are referenced Kos and the transmission time is referenced t.sub.-- Ub. The change in the delay time is referenced dtV and the delay itself is referenced tV. In the dependability criteria, the connection dependability is referenced VSAF, the node dependability is referenced as NSAF and the packet dependability is referenced as PSAF. Three rule bases are preferably subsequently produced for these three groups, these defining the corresponding intermediate variables, that is, the linguistic variables for performance of the connection, time behavior of the connection and dependability of the connection. In this two-stage method, these linguistic variables represent intermediate variables. However, it is also conceivable that these variables are directly evaluated via arithmetic methods in order to identify a weighting for the corresponding line. The individual fuzzy rule sets are thereby referenced as follows. The performance rules are referenced L.sub.-- R, the time rules are referenced V.sub.-- R and the dependability rules are referenced S.sub.-- R. The driving intermediate variables for the performance are referenced POW, are referenced t for the time and SAF for the dependability. For example, these linguistic intermediate variables are then supplied to a second stage with the principal rules H.sub.-- R with which the weighting for the respective line is calculated on the basis of fuzzy logic. For example, this weighting represents an evaluation number from the interval, 0, 1. A number close to 1, for example, thereby denotes a very good evaluation and a number close to 0, analogously thereto, denotes a very poor evaluation. This weighting can then be directly employed as input for an algorithm Sho that calculates the shortest connection on the basis of the weighting WEIG.

For example, this weighting is made available via the processor PRO1 as g.sub.-- L at an output of the evaluation system. The edge weighting for the respective connection in the form of the inverse weighting is made available as Kan by the processor PRO2 at a further output. The two-stage

version of the inventive method thereby has the following advantages:

1. The intermediate variables, for example, can be directly supplied as input quantities to a routing algorithm functioning on the basis of fuzzy rules.

2. As a result thereof, the design of the rule base takes on a more surveyable form. It can be easily imagined that a rule base for eight input variables can become extremely unsurveyable. The design of the rule base can thereby be systematically fashioned due to the grouping of the input variables.

FIGS. 3-5 recite examples of the individual linguistic variables. For example, the interval, 0, 1, has formed the basis of all variables as universe of discourse. For example, the measured values are normed to this interval before input into the fuzzy system. Only the variable "change of the delay time" represents an exception.

FIG. 3 recites an example of the affiliation function of the linguistic variables of capacity. Five fuzzy sets, "VL" (very low), "LOW", "MED" (medium), "HIGH", and "VH" (very high) with, for example, delta affiliation functions given LOW, MED and HIGH or, respectively, half delta functions given VL and VH are preferably [. . .] for the evaluation of the capacity. By way of example, FIG. 3 shows the graphic presentation of the variables "capacity". Preferably, the variable "cost of the connection" is fashioned just like the variable "capacity", as is the variable "transmission time of the connection". The interval, -1; 1, preferably forms the basis for the "variable change of the delay time" as universe of discourse. The operational sine of the change of the delay time can then be advantageously also taken into account in the evaluation. The fuzzy sets therefor are correspondingly named "NM" negative-medium, "N" negative, "ZERO", "P" positive and "PM" positive-medium. The following, further variables taken into account are preferably constructed just like the linguistic variable of capacity: Delay time; Connection dependability; Node dependability; and Packet dependability.

The affiliation functions for the linguistic variables presented here merely represent examples. A person skilled in the art who wishes to replicate the invention can also provide other affiliation functions in detail for technical reasons that are not triangular but comprise some other curve shape. On a case-by-case basis, it can also be meaningful for technological reasons to provide a plurality of fuzzy sets for evaluation.

Arnold, col. 2, l. 59 though col. 8, l. 65.

In short, the cited portion of *Arnold* describes the summary, brief description of drawings, and the descriptive text associated with figures 1-3. As shown above, *Arnold* describes monitoring the *behavior* of a network. The summary describes the uses of *Arnold's* techniques. In particular, the summary provides for evaluating communication connections and selecting those connections with the highest evaluated criteria. The network load and costs for the parties to a communication are minimized. Fuzzy logic is used to evaluate the criteria. *Arnold* implements these procedures at each node of a communication network to increase reliability.

However, nothing in this portion of *Arnold* describes "outputting the health *of the computing system component*," as required by claim 1. No matter how the examiner interprets the word "health" in the claim, in no case does *Arnold* describe outputting the health of an individual *computing system component*, as required by claim 1. *Arnold* instead monitors the *behavior* of networks, not the health of the underlying computing system components.

The brief description of the drawings does not shed any additional light on *Arnold's* teachings. This section of *Arnold* does not teach, "outputting the health *of the computing system component*," as required by claim 1.

The text of figure 1 of *Arnold* describes a schematic diagram for the interaction of a plurality of components in a multi-node network. *Arnold's* methods begins at the point where it is important to improve the measurement, the determination, and the evaluation of the topology parameters of the network. *Arnold* does take into account the physical components of the network; however, *Arnold* does not actually output the "health *of the computing system component*," as required by claim 1. Instead, *Arnold* takes into account the impact of the physical network components on the *behavior of the network.* Again, the behavior of the network is what *Arnold* monitors and outputs, not the health of the individual computing system components.

The text of figure 2 of *Arnold* describes an example of an evaluation system of communication connections. *Arnold* evaluates the communication connections, but *Arnold* does not output the "health *of the computing system component*," as required by claim 1. Instead, *Arnold* uses the evaluation of the connections to evaluate which connections to use when establishing communication between clients. Thus, *Arnold* described monitoring the *behavior* of

a network, and does not output the "health *of the computing system component*," as required by claim 1.

The text of figures 3 through 5 of *Arnold* provides examples of the individual linguistic variables. Specifically, figure 3 provides an example of the affiliation function of the linguistic variables of capacity. These variables are provided to designate factors such as transmission time, packet delay, capacity, the cost of the connection, and other variables. However, again, *Arnold* described monitoring the *behavior* of a network, and does not output the "health *of the computing system component*," as required by claim 1.

In summary, Applicants have shown that *nothing* in columns 3 through 8 of *Arnold* teaches, or even suggests, the plain language of claim 1. Therefore, *Arnold* does not anticipate claim 1.

III. Argument 3

In the examiner's answer, the examiner makes the following assertions:

> In summary, appellants mainly argued that *Arnold* does not teach "wherein the at least one fuzzy rule set ***includes at least one hedge"*** and ***'applying at least one hedge algorithm"*** (emphasis added).
>
> In response to 'appellants' argument, examiner asserts *Arnold* teaches "wherein the at least one fuzzy rule set includes at least one hedge" at col. 8, col. 9, lines 29-56 and also Figs. 3-5. *Arnold* describes at col. 8, lines 37-50 "Fig. 3 recites an example of the affiliation function of the linguistic variables of capacity. Five fuzzy sets, 'VL" (very low, "LOW", "MED" , "HIGH" , and 'VH" (very high) ... evaluation. " Examiner asserts *Arnold's* affiliation functions 'LOW", "MED" , "HIGH" to read on fuzzy rule sets of appellants, and "very" to read on hedge of appellants.
>
> *Arnold* teaches "applying at least one hedge algorithm" at col. 9, lines 29-56, specifically "the formulation of the rules is a heuristic ... evaluated." Since appellants have not disclosed nor claimed any particular algorithm, examiner chose one. Heuristic means an algorithm.
>
> On this basis, Examiner asserts *Arnold* anticipated the argued limitations. Therefore, the rejection STANDS.

Examiner's answer of July 16, 2007, pp. 16-17 .

This statement is made with respect to claim 8. Claim 8 is reproduced again below:

> 8. The method of claim 7, wherein the at least one fuzzy rule set includes at least one hedge and wherein determining a fuzzy data set in which the metric data is classified includes applying at least one hedge algorithm associated with the at least one hedge to the metric data.

Again, the examiner's statements are completely without merit or support. The examiner asserts that, "Arnold's affiliation functions 'LOW", "MED" , "HIGH" to read on fuzzy rule sets of appellants, and "very" to read on hedge of appellants." The examiner has provided utterly no basis to assert that the word "very" matches the claimed term "hedge." Instead, the assertion is plainly and manifestly incorrect.

Additionally, the examiner's assertion that applicants have not claimed any particular algorithm is, on its face, simply wrong. Claim 8 requires, "applying at least one hedge algorithm associated with the at least one hedge to the metric data." Applicants specifically claim a hedge algorithm.

The examiner's implied assertion that *Arnold* teaches a hedge algorithm is also plainly wrong. Nothing in *Arnold* teaches, or remotely suggests, this claimed feature. Therefore, *Arnold* does not anticipate claim 8.

IV. Argument 4

In the examiner's answer, the examiner makes the following assertions:

> In response to appellants1 argument that Examiner failed to state a prima facie obviousness rejection because neither *Arnold* nor *Bigus* teach or suggest all features of claim 1, from which claim 25 depends.
>
> *Arnold* anticipated appellants' claim 1 as rejected above and Examiner has also responded to appellants' argument regarding claim 1 in argument 1 and argument 2. Therefore, the proposed combination of *Arnold* and *Bigus* is proper.
>
> On this basis, the rejection STANDS.

Examiner's answer of July 16, 2007, pp. 18-19 .

The examiner's reply does little more than re-iterate the erroneous propositions made with regard to claim 1. Thus, Applicants rely on the response to the rejection of claim 1 to counter the examiner's statements made here.

V. Argument 5

In the examiner's answer, the examiner makes the following assertions:

> In response to appellants argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).
>
> > In response to Applicant's argument that there is no suggestion to combine the references, the Examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of references. In re Nomiya, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Semaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughlin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969).
>
> In this case, the motivation to combine *Arnold* and *Bigus* would be to maximize system efficiency (*Bigus*, page 2442, left column, line 20)

Examiner's answer of July 16, 2007, pp. 19-20 .

The vast bulk of the examiner's response is directed to copying and pasting propositions of law that the examiner then ignores and does not apply to the present case. The only statement of substance that the examiner makes is that, "the motivation to combine *Arnold* and *Bigus* would be to maximize system efficiency," (citation omitted). However, the examiner does nothing to rebut the showing made in the appeal brief that no rational reason exists to combine *Arnold* and *Bigus* because these two references are directed towards wholly different problems.

Furthermore, the examiner's asserted motivation to combine the reference does not satisfy the requirements imposed by the Supreme Court of the United States on stating a valid

obviousness rejection. Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. *KSR Int'l. Co. v. Teleflex, Inc.*, No. 04-1350 (U.S. Apr. 30, 2007). Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Id.* (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006)).

As provided by the court in *KSR Int'l*, "an apparent reason" must exist to combine the known elements *in the fashion claimed.* Obviousness rejections cannot be sustained by conclusory statements, but rather the examiner must provide an articulated reasoning *with some rational underpinning* to support the legal conclusion of obviousness.

The asserted motivation of "maximizing system efficiency" is unrelated to *claim 1.* Claim 1 has nothing to do with maximizing system efficiency. Instead, claim 1 is directed to outputting a health of a computing system component, as recited in claim 1 itself. Because the examiner provides no reason <u>to combine the references *to achieve the claimed invention*</u>, the examiner has provided <u>*no*</u> rational underpinning to support the legal conclusion of obviousness. Instead, the examiner has only put forward a generic reason to combine the references without regard to how one of ordinary skill would view the combination of references *with respect to claim 1.* Thus, the examiner failed to satisfy the requirements of *KSR Int'l* and, accordingly, has failed state a *prima facie* obviousness rejection.

VI. Argument 6

In the examiner's answer, the examiner makes the following assertions:

> In response to appellants argument that no motivation exists to combine *Arnold* and *Bigus* because they address different problems, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See In re Oetiker, 977 F. 2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both *Arnold* and *Bigus* are directed to computing system and using measured metrics to

evaluate its performance.

Examiner's answer of July 16, 2007, pp. 21-22.

The examiner asserts that because *Arnold* and *Bigus* are directed to computing systems and using metrics to evaluate performance, these references can be relied on as references when stating an obviousness rejection. However, again, the examiner has completely misunderstood Applicants and the law.

The citation to *In re Oetiker* relates to whether *Arnold* and *Bigus* are *analogous art*. Applicants are not arguing, in this section of the appeal brief, that *Arnold* and *Bigus* are non-analogous art to claim 1. (Note that Applicants do not concede that either *Arnold* or *Bigus* are analogous to claim 1.) Rather, Applicants argue that because *Arnold* and *Bigus* are directed towards different problems, *no rational reason exists to combine the references <u>to achieve the claimed invention</u>.*

Thus, this argument of the appeal brief is directed to the *heart* of the determination of obviousness - whether there exists a motivation or rational reason for one of ordinary skill to combine the references to achieve the claimed inventions. Applicants have shown that no such motivation or reason exists because, as the references are so disparate from each other, one of ordinary skill could not combine the references *to achieve the claimed invention.* Accordingly, *Bigus* and *Arnold* cannot be combined to state a *prima facie* obviousness rejection against any of the claims. Therefore, the obviousness rejection is overcome.

CONCLUSION

As shown above, the rejections are erroneous. Therefore, Applicants request that the Board of Patent Appeals and Interferences reverse the rejections. Additionally, Applicants request that the Board direct the examiner to allow the claims.

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